

Popular science summary

The last decades in science gathered convincing evidence, that the human sense of smell is better than we used to think and can compare with the olfaction of animals considered super smellers. We can think and feel with our noses thanks to neural projections to the orbitofrontal cortex and neuroanatomical connections with the amygdala-hippocampal complex. In the contrast to all other senses, the olfactory system bypasses the thalamus when conveying neural signals. Thus, odors are the only stimuli received by our sensory systems that can directly affect our cognition and emotion.

Preschool is a period of rapid olfactory, cognitive and emotional development. Still, little is known about the relationship and interdependence of these three domains, how they develop, at what pace, and whether there are gender-related differences. Most studies were conducted among adults, and a few studies conducted among children are fragmentary and rarely presented a comprehensive perspective on the joint developmental changes of olfaction, cognition, and emotion. The state-of-the-art is mostly cross-sectional and lacks longitudinal evidence. The aim of the proposed project is to systematically document these changes and examination of their relationships. To achieve this, a longitudinal panel of 248 children will be constructed. Children aged 4 years and their parents will be invited to participate in the study. The research team will accompany the families for 3 consecutive years, measuring olfactory, cognitive, and emotional abilities every six months. Supplementary information on the child's development will be obtained from the parents. The longitudinal design will allow observing individual changes and refer them to the changes on the group level. Thanks to advanced statistical modeling, the research team will be able to formulate conclusions about the interdependencies of the observed changes in the variables of interest.

The project is interdisciplinary because it combines psychological, physiological and medical perspectives. Although the current project concentrates on behavioral measures, it has a good chance to lay a solid foundation for further investigations among children, involving more logistically and financially demanding techniques such as fMRI or endocrinologic measurements. If the mutual interaction of olfactory, cognitive, and emotional development in children is confirmed during this investigation, the project opens further possibilities to supplement preschool education with olfactory themes, workshops on odor identification, discrimination, and odor presentations. Eventually, preschool education may even extend to culinary and environmental education, which are tightly related to olfactory perception. Such changes introduced to preschool education could possibly lead to increased interest in odors and odor awareness in children and further support their cognitive and emotional development.